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Retrofitting Strategies for Earthquake Safe Existing Reinforced Concrete Building: An Overview

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Abstract – Retrofitting of existing structures offers noteworthy open doors for diminishing worldwide vitality utilization and ozone depleting substance emissions. This paper gives a methodical way to deal with legitimate determination and distinguishing proof of the best retrofit alternatives for existing structures. An overview of the innovative work and in addition utilization of the retrofit advances in existing structures is additionally given.

Keywords: existing RCC structure, seismic retrofitting, strategy selection,

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INTRODUCTION

To reduce the higher degree of damage and disaster impact in building during earthquake retrofitting is required. If building has inadequate seismic resistance, the selection of the retrofitting strategies has the important technical and social role. The structural system of deficient building should be adequately strengthened in order to increase the seismic resistance. Retrofitting is needed in such structures with following type of deficiencies like inadequate shear capacity, core confinement and rebar splicing of columns; inadequate shear capacity, rebar anchorage and plastic hinge rotation capability of beams and inadequate confinement of beam-to-column joints. Some commonly observed irregularities which also need retrofitting as a remedy are the presence of soft and weak storey at the open ground floor, in-plane discontinuity and out-of-plane offset of the ground floor columns and eccentric mass. Retrofitting is done for increasing the strength, stiffness and ductility of the elements or the whole structure.

Goals of seismic retrofitting: (IS 13935:1993)

- Goals of seismic retrofitting are summarized as follows:
- Increasing the ductility to enhance the energy dissipation capacity.
- Increasing the lateral strength and stiffness of the building.
- To give unity to structure.
- To eliminate such factors which are responsible for the concentration of stresses.
- To enhance the redundancy (lateral load) which are resisting the elements.
- Strategy which we are going to adopt must be economical.
- Adopted strategy should fulfill the objectives.
- While adopting any strategy for the retrofitting, the main factor which is considered is safety under design basis earthquake (DBE) along with structural stability.

Strategies of retrofitting:-

There are two types of strategies of retrofitting: local and global

A. Local retrofit strategies

B. Global retrofit strategies

C. Local retrofit strategies: It means strategies are applied by considering the deficiencies in the elements.

D. Global retrofit strategies: It means strategies are applied by considering the deficiencies pr irregularities in whole structure.

Techniques of seismic retrofitting:-

Following techniques are adopted for the seismic retrofitting based on their strategy.

1. Base isolators: These are adopted for both newly constructed and existing structure. Isolating pads or base isolators replaces the material of the foundation. And steel or reinforced concrete beams replaces the connections of the foundations. Base isolation restricts the transmission of the ground motion to the buildings.

2. Supplementary dampers: It absorbs the energy of motion and converts it to heat. The energy dissipation capacity of structure is increased by using supplementary dampers.

3. Tuned mass dampers: These are adopted mainly to reduce the sway of structure due to wind.

4. Slosh tank: It is used in case of lateral sway motion. Here, the concept of slosh dynamics is used.

5. Addition of structural support/ reinforcement: It is adopted in case of lower buildings. It helps by adding strength to the existing structure to resist seismic forces.

LITERATURE REVIEW

Amlan K. Sengupta, Chemuru Srinivasulu Reddy, Badari Narayanan V T and Asokan A: analyzed seismic examination and retrofit of existing multistory structures in India – an outline with a case study. In this they have studied two schemes (1. to enhance the capacities of the columns in the ground storey. 2. to reduce the stiffness of the building). The paper introduces a review of the current retrofit systems that are material for multi-storied residential reinforced concrete buildings tended to in the project. It likewise shows an investigation of a three storied building, situated in a urban area in earthquake zone III.

Zhenjun Ma, Paul Cooper, Daniel Daly, Laia Ledo: studied existing building retrofits, methodology and state-of-the-art. This paper gives an orderly way to deal with appropriate determination and distinguishing proof of the best retrofit choices for existing buildings. A diagram of the innovative work and in addition use of the retrofit advances in existing structures is additionally given. The point of this work is to furnish building scientists and specialists with a superior comprehension of how to adequately lead a building retrofit to advance vitality protection and supportability.

Ciro Faella, Enzo Martinelli, and Emidio Nigro: examined seismic assessment and retrofitting of RCC existing buildings. In the present paper, the exceptionally difficult subject managing appraisal and retrofitting of existing structures composed without seismic criteria has been dealt with. As a short parametrical examination, the impact of subsoil firmness on the seismic helplessness of the building has been investigated bringing up that vulnerability can be significantly bigger as subsoil is less solid.

Angelo Anelli, Michelangelo Laterza and Marco Vona: investigated on selection of optimal seismic retrofitting strategy for existing RCC building. Based on the contextual analysis revealed in this work it is obvious that the seismic retrofitting of existing RC structures requires a dynamic administration method both for the outline and for observing of its phases. The primary plan stages have been:

(i) Basic appraisal against seismic and gravity loads,

(ii) Definition and correlation of some retrofit techniques,

(iii) Determination of a retrofit methodology in view of the consequences of the basic structural assessment, architectural and economic considerations, functional strategies and quantitative appraisal of the work environment for well-being and security.

Ingy El-Darwish, Mohamed Gomaa: worked on retrofitting strategy for building envelopes to achieve energy efficiency. The reason for this paper has been to show a general diagram of the retrofit factors keeping in mind the end goal to analyze the nearby connection between the distinctive retrofit factors and energy efficiency in Egypt's hot atmosphere. It was an attempt to review the possibility of changing the needs through recreation tests on the diverse outline parameters that had solid effect impact on micro climate. The substance has secured retrofit upgrade strategies that have solid effect on vitality utilization through a portion of the building envelope parameters.

Pierluigi de Berardinis, Marianna Rotilio and Luisa Capannolo: studied energy and sustainable strategies in the renovation of existing buildings: an Italian case study. The exploration outlined in this paper demonstrates the significance of the procedure of investigation, not just of the formal, material and social verifiable parts of a building and its specific situation yet in addition of the useful and

execution conduct of the building components, to accomplish a total and far reaching portrayal of the building components in view of the interconnecting of differing examination

Yutong Lia, Jun Ren, Zhou Jing, Lu Jianping, Qing Ye and Zhijun Lv: studied the existing building sustainable retrofit in china with a review and case study. After applying the passive design strategies on this project the researchers come to know that they have saved both construction and operation cost which proves its commercial feasibility.

Future scope

- The infill walls are non-load bearing walls just like cavity walls. The effect of openings in the infill walls was not considered by the researcher in majority. This effect needs to be considered for study and further investigation.

- A retrofit procedure is an answer for a particular issue in a building or in its segments. The test is to create guidelines that are nonexclusive in nature.

Methodology

Following steps are covered under the methodology of seismic retrofitting:

I. Identify your flood risk

II. Identify your flood elevation

FEMA (Federal Emergency Management Agency) maps are used to determine the flood zone and flood elevation.

I. Review relevant regulations

II. Identify your adaptation strategy

III. Design your strategy

CONCLUSION

In this paper the phases of the procedure to define the optional retrofitting strategy of existing RCC buildings are described. In summary, a complete writing survey was performed keeping in mind the end goal to pick up a superior knowledge into the key issues significant to seismic retrofit of RCC structure. A portion of the specialists examined the different seismic retrofitting and reinforcing strategies for existing building. All these topics require additionally research, and it is fundamental for seismic retrofitting of fortified solid structures. By the assistance of programming and systematic strategy we locate an extraordinary outcome.

REFERENCES

Amlan K. Sengupta, Chemuru Srinivasulu Reddy, Badari Narayanan V T and Asokan A, (2004)"*seismic analysis and retrofit of existing multistoried buildings in India – an overview with a case*"

Zhenjun Ma, Paul Cooper, Daniel Daly, Laia Ledo, (2018) *"Existing Building Retrofits: Methodology and State-of-the-Art"*

Ciro Faella, Enzo Martinelli, Emidio Nigro, (2004) "*Seismic assessment and retrofitting of r.c. existing building"*

Angelo Anelli, Michelangelo Laterza and Marco Vona, (2016) "*Selection of optimal seismic retrofitting strategy for existing RC building*"

Ingy El-Darwish, Mohamed Gomaa, (2017) "*Retrofitting strategy for building envelopes to achieve energy efficiency"*

Pierluigi de Berardinis, Marianna Rotilio and Luisa Capannolo, (2017) *"Energy and Sustainable Strategies in the Renovation of Existing Buildings: An Italian Case Study"*

Yutong Lia, Jun Ren, Zhou Jing, Lu Jianping, Qing Ye and Zhijun Lv, (2017) "The *Existing Building Sustainable Retrofit in China-A Review and Case Study*"

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